DOCUMENT RESUME

ED 327 392 SE 051 839

AUTHOR Rancifer, Jesse L.; Pinchback, Carolyn
TITLE The Decline of Blacks in Mathematics: Implications for Elementary, Secondary, and Higher Education.
PUB DATE 90
NOTE 23p.; Paper presented at the Annual Meeting of the Mid-South Educational Research Association (New Orleans, LA, November 13-16, 1990).
PUB TYPE Reports - Evaluative/Feasibility (142) -- Speeches/Conference Papers (150) --

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; *Black Students; *College Mathematics; *Elementary School Mathematics; Elementary Secondary Education; Field Dependence Independence; Higher Education; *Mathematics Education; Minority Groups; Role Models; *Secondary School Mathematics; Socioeconomic Status; Student Attitudes; Student Participation; Teaching Methods

ABSTRACT

The decline of blacks in mathematics is a disjuncture in education that is not easily understood. It is an issue that has been discussed and researched for decades. The purpose of this literature review was to review findings that contribute to the decline of blacks in mathematics and to explore some of the implications of this decline for elementary, secondary, and higher education. This review covers five areas: (1) achievement; (2) role models; (3) attitudes; (4) socioeconomic status; and (5) teaching methods, including field dependent and field independent methods. Lists of implications for elementary, secondary, and higher education are provided. A list of 24 references is included. (CW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED327392

THE DECLINE OF BLACKS IN MATHEMATICS: IMPLICATIONS FOR ELEMENTARY, SECONDARY AND HIGHER EDUCATION

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Jesse L. Rancifer

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BY

DR. JESSE L. RANCIFER
ASSOCIATE PROFESSOR
ADMINISTRATION AND SECONDARY EDUCATION
UNIVERSITY OF CENTRAL ARKANSAS

DR. CAROLYN PINCHBACK
ASSOCIATE PROFESSOR
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCES
UNIVERSITY OF CENTRAL ARKANSAS

Mid South Educational Research Association
Monteleane Hotel
November 13-16, 1990
New Orleans, Louisiana

SE051839

THE DECLINE OF BLACKS IN MATHEMATICS
IMPLICATIONS FOR ELEMENTARY, SECONDARY AND HIGHER EDUCATION

DR. JESSE L. RANCIFER, ASSOCIATE PROFESSOR
ADMINISTRATION AND SECONDARY EDUCATION
UNIVERSITY OF CENTRAL ARKANSAS

DR. CAROLYN PINCHBACK, ASSOCIATE PROFESSOR
MATHEMATICS
UNIVERSITY OF CENTRAL ARKANSAS

The decline of Blacks in Mathematics is a disjuncture in education that is not easily understood. This issue has been discussed and researched for two or more decades. Yet, it does not appear that the issue is being resolved with a high level of certainty.

In a study of 683 Senior High School students (33% Black and 67% White) which compared the attitudes toward Mathematics of Black vs. White Secondary students enrolled in college preparatory or non-college preparatory mathematics, Rancifer (1978) found that counseling, teaching, and enjoyment have an educationally significant effect upon Black students in electing mathematics programs. Rancifer (1978) also found that counseling, teaching, and jobs have an educationally significant effect upon White students electing mathematics programs.

It is quite evident in this study that when the results for the groups are compared, they differ only in one variable. Again, White students were influenced to study college preparatory mathematics by counseling, teaching, and jobs; Black students were influenced to study college preparatory mathematics by counseling, teaching and enjoyment. The jobs variable did not influence Black students to study college preparatory mathematics. This is true,

perhaps, because Black students did not see themselves in the teachers teaching upper level courses in mathematics or in jobs requiring higher level skills in mathematics. This situation has not changed for Black students. The Black secondary mathematics student is still in the same environment with essentially the same attitude or perception.

There are "gate keeping courses" in the Secondary School Curriculum. Algebra I is such a course. If a student is not successful with Algebra I, the student will not be permitted or given an opportunity to study Geometry or Algebra II, etc. Failing or poor performing students in Algebra I are placed in a remedial mathematics curriculum. This is the curriculum where most Black students are found.

College Board tracked 15,491 high school graduates of Hispanic, African American, Native American and low-income students who mastered Algebra and Geometry. It found that these students succeeded in College at almost the same rate as higher income and White students.

A casual observation of our public secondary mathematics classrooms will reveal that Black students are under represented in upper level courses in mathematics. In fact, Black and low ability students suffer most from the general lack of taking advantage of the opportunity to study upper level mathematics in public schools. Though some would argue that schools have experienced an overall decline in the interest in studying upper level mathematics courses, which is true. For instance, research shows that only 40

percent of Whites take Algebra and Geometry and only 19 percent of African Americans; just 17 percent of Hispanics.

There are many reasons given for a lack of Blacks in Mathematics. Johnson (1984) listed the following as contributing factors: (1) an absence of role models (2) lack of significant others such as parents, (3) failure to receive positive career counseling, (4) view of math as a subject appropriate for White males, (5) inability to see usefulness and relevance of math to their lives and (6) lack of success in previous math courses.

The purpose of this study is to review findings that contribute to the decline of Blacks in mathematics and to explore some of the implications for elementary, secondary and higher education because of the decline of Blacks in mathematics. Therefore this study, for this purpose, the review of related literature will cover five (5) broad areas of Blacks in Mathematics. These areas are as follows:

I. Achievement

II. Role Models

III. Attitudes

IV. Social- economic Status

V. Teaching Methods (School)

   A. Field Independent

   B. Field Dependent

BLACK STUDENT ACHIEVEMENT IN MATHEMATICS

Many studies have addressed the issue of Black student achievement in mathematics. Some of these studies have analyzed Black student achievement in terms of their opportunity to learn mathematics. Davis (1986) in a cross-sectional study of mathematics achievement data on 14,289 Black, White and Hispanic 17 year-old students from the third NAEP assessment, reported significant racial and ethnic differences in enrollment by curriculum (general versus academic) and in achievement.

Some studies have attempted to study Black and White student achievement in post-secondary situation. For instance, Wolfe (1983) found in general that knowledge of vocabulary increased after high school, while knowledge of mathematics declined.

Achievement motivation in some findings does not appear to be the inhibiting factor. In examining the student's educational aspirations and course enrollment practices in a sample of California High School Sophomores, George (1988) reported that the students had high aspirations with 50% planning to attend a four-year college in the two years following high school graduation. George (1988) also reported that while 65% of the students had a career goal, many lacked congruence between their career goal and their high school program. Ascher (1983) reported that although Black students showed more positive attitudes towards math learning than their White counterparts at all grade levels tested, this motivation alone was not sufficient to insure successful math performance.

However, Willig and Etal (1983) in a study of 397 Anglo, Black, and Hispanic students concluded that motivation contributed to low academic achievement in all groups; casual attributions were more predictive for Blacks and Anglos, while anxiety scores were more predictive for Hispanics.

According to Erbe and Van-Dam (1982) in spite of pervasive differences in achievement and attitudes, the variables of race and school district explain, at best, only one-fourth of the variation in achievement and attitudes. In an effort to explain children's competence in math concepts and computations at the time they begin first grade, Entwisle and Alexander (1989) with a large random sample of urban children found that Blacks and Whites are equivalent in terms of computational and verbal skills as measured by the California Achievement Test at the start of grade one.

Many Black students can not take advantage of career opportunities in mathematics and math related field because of prerequisite knowledge or a lack of the basic rudimentary skills required for successful experiences in upper level secondary courses in mathematics. I do not believe that Black students or any student will be flocking to upper level courses in mathematics in which they lack the basic skill rudiments in the course to succeed.

When the formal classroom is considered; Black children tend to bring with them to this setting the same intellectual competencies in mathematical thought and cognitive processes as their White counterparts (Ascher, 1983; Cole and Scribner, 1974;

Ginsburg, 1978; Ginsburg, and Russell, 1981). As concluded by Stiff and Harvey (1988) the difficulty that Black students encounter in mathematics learning does not reveal itself before formal schooling takes place and is, therefore, attributable to the experiences that Blacks undergo in the school setting. Therefore, it is somewhat obvious that Black students' learning in mathematics is tied to teaching, which is tied to Black student achievement in mathematics, which is tied to Black student enrollment in upper level mathematics courses.

ROLE MODELS

Our society generally does not recognize the contributions of Blacks to human endeavors in Public School textbooks. As a consequence, Black children may not be exposed to prominent Black individuals and their contributions to the American way through activities in the classroom.

Role models have been used in some programs to attract minority youth to careers in engineering and technology. For instance, Project P.A.C.E. in 1984, using 50 high school students from 5 area high schools with high concentration of minority students required students in the program to participate in weekly Saturday morning programs. These programs were taught by mathematicians, scientists, and engineers who were themselves members of minority groups. Project P.A.C.E. reported that in all, 10 high school seniors, who participated in the 1983-84 program, enrolled in a four year college or university - 9 of them enrolling

in a math or science program. So, role models proved to be successful in attracting minority students to math and science programs.

Researchers on Blacks and females have discussed the widespread belief that they cannot learn mathematics as easily as White males. It appears that these groups do not know there are role models for their groups in the mathematical world. Kenschaft (1987) stated that they are not even told about the existence of the convincing role models that do exist. Thus, it is especially important to recognize that many Blacks have overcome these obstacles and become leaders in the mathematical world.

Some studies on role models have compared student responses in traditional career field programs to non-traditional career programs. Cooper (1983) in a study of 254 Black college students (111 in traditional career field programs, 143 in non-traditional career field programs from 5 different colleges) found that non-traditional aspirants, in addition to having higher scholastic aptitude test (SAT) scores; they also had more non-traditional occupational role models than their traditional-oriented peers.

In addition to Cooper (1983), Johnson (1982), Johnson (1984) and Matthews (1984) reported that Black students are influenced by "significant others" such as teachers, parents, other relatives, and counselors. These findings as suggested by Stiff (1985) stated that Black mathematics teachers become some of the earliest examples of Black scientist and are important role models for the students they teach.

The counselor as a significant other for Black students maybe the gateway to many upper level mathematical experiences. Rancifer (1978) found that students in college prepartory mathematics received more counseling to select the program than non-college preparatory mathematics students did. Stiff and Harvey (1988) concluded that the roles of teachers and counselors in "tracking" Blacks into vocational or remedial math programs is of particular significance to junior high and middle school students and their parents.

In desegregrated school systems, college preparatory mathematics courses are usually enrolled by predominantly White students. Thus, this research suggest that these students are receiving more counseling to enroll in upper level mathematics courses than Black student.

SOCIOECONOMIC

It is believed by many educators, parents, administrators, etc., that the socioeconomic status of the Black students' parents or guardians may have an effect on the performance of their children in mathematics. Some believe that by having less money, the children will not be able to compete with those whose economical status is higher. These people further believe that this lack of not being able to compete will result in underachievement with a decline in the students selecting advanced mathematics courses. Then there are those who believe that it does not matter. Also, there are others who believe that there are other factors to consider besides the socioeconomic status (SES).

It would seem reasonable that college graduates, regardless of their race, with similar backgrounds, SES, would have similar achievements in mathematics. This was not the case. Wolfe (1983) reported on the effects of higher education for 451 Blacks and 1738 Whites on achievement in vocabulary and mathematics while controlling for socioeconomic background (both parents' education with a range of less than high school to Ph.D. and father's occupational status). The subjects were tested in 1972 and again in 1979. In 1972 he found that those from families of higher SES generally scored higher on achievement test. By race he found that Whites tended to score higher than Blacks. In 1979 he found that those who did well on the tests in high school continued to do well later with only the father's education having a significant effect upon performance. Similar to 1972, Blacks did not achieve as well as Whites.

It is believed that Blacks, in general, have a low SES and many live in the same area, and consequently, they do not perform well in mathematics. Ascher (1985) reported that the students' SES---that is, the father's income, income of the school district, and average income of the student's neighborhood---had an effect on their achievement in science. To be specific, the SES increased as a predictor of the achievement. Furthermore, the effect of being Black was similar to the SES' effect.

Reyes and Stanic (1985) also found that the SES played a major role in mathematics achievement. They attempted to explain the race-related differences in mathematics achievement by constructing

a model, which was based on the assumption that these differences could not be understood without considering the factors of social class and gender. It was not possible to omit the SES because it was vital in understanding race-related issues in academic achievement due to the disproportionate number of minority members who are low in SES and the disproportionate number of majority members who are high in SES. Without attention to SES, it would be possible that race and SES are confounded. Therefore, researchers should be able to distinguish between race and SES. Kirk, Hunt, and Volkmar (1975) reported on the number recognition skills of 4 year olds with race, gender, and SES as independent variables. They found the differences by SES of students---those with high SES scored higher than the low SES on these skills. This supported the possibility that SES, and not race nor gender, played the significient role.

The SES of a student has resulted in biasness in the education system. Teachers, administrators, etc. tend to classify a student as being a low achiever because his/her parents do not have a high SES. The student is given little chance of growth because they are all grouped together. Ascher (1983) stated that low-income, inner-city, minorities or low achievers tended to be placed together early in their schooling and to be taught by the same types of teachers with similar instructional methods. This results in similar problems in mathematics with similar remediation treatment. Unless the student is exceptionally determined, the system will continue to perpetuate the practice of grouping low SES together,

regardless of the ability of the student.

Harvey (1988) looked at SES from another point of view. He addressed the need of mathematics for employment. The education in mathematics would be essential for Black Americans if they wanted to have a high SES or just to have a decent job. He reported that because the world is moving towards an ongoing transformation from an industrial economy to an information and service economy which requires quantitative and qualitative levels of educational development in order to meet these demands many Blacks will be unable to attain the access to meaningful employment without a strong mathematics background. Such a situation would widen the achievement gap between Blacks and Whites in mathematics.

Some people believe that their children will get a better education by attending a private school. Such a belief would imply that the majority of those attending the private schools have a higher SES than those in the public schools. Willms (1982) examined the differences between public and private schools in the achievement of mathematics along racial class lines. He found that there were no differences in the academic achievement between public and private schools for advantaged Whites and there were small but significant differences for minorities and disadvantaged. It should be noted, however, that the students in private schools represent a selective group of students.

ATTITUDE

The attitude of a student plays a major role in his or her performance. If the student has a positive attitude toward the

subject, the student will continue to strive for understanding, perfection, and satisfaction. It is vital that the attitude remains positive all through school by beginning as early as kindergarten. Starting this early will allow the students to grow stronger by continually seeking knowledge and understanding.

Sang (1987) found attitude to be important in mathematics achievement. In his report on the Mayo Clinic approach to academic achievement, he stated that the essence of learning is one's attitude. Furthermore, due to the fact that attitude is developed and not born, educators, administrators, etc., must feel good about themselves and their students because students do not always rise to the teachers' expectation but the students need to be provided with the capability and the desire to succeed. Such a process must begin in Kindergarten, since a National Merit Scholar cannot be made by starting in high school, Sang (1987).

Thomas (1983) reported that the attitude of high school students influenced their enrollment in advanced mathematics courses. Specifically, it was found that after controlling for the education of the parents and high school grade performance, mathematics affinity (the extent to which Blacks liked high school) affected their enrollment in advanced mathematics courses.

Tobias (1978) found that math avoidance resulted from the natural consequence of a set of attitudes that had developed from the student's early educational experience. By avoiding mathematics because of their attitude, students hurt their chances of being prepared for college without the possibility of taking a

remedial course.

Math anxiety is undoubtly tied to Black student avoidance of upper level courses in mathematics. According to McClellan (1984), Mathematics anxiety is the greatest obstacle facing many Black students. McClellen also listed seven common causes of mathematics anxiety among Blacks:

1. low expectations and callous reactions of teachers to student questions
2. teachers overemphasis on fundamental and computational procedures rather than creative problem solving
3. parental expressions of their mathematics difficulties
4. inadequate knowledge of Black achievement in science and engineering
5. the belief that special talents are needed and
6. the failure to be properly trained in early grades.

MATHEMATICS TEACHING STRATEGIES

Some writers feel that mathematics learnings have something to do with the language development of the Black student. They perhaps feel effective use of the language in vogue may have an effect on the student's performance in a course. That is, if the student does not speak the standard language of the country, then the student has problems in the communications of ideas. Jones (1990) reported that poor teaching methods may have more to do with low mathematics comprehension than Black English usage. Furthermore, the poor teaching methods could affect Whites and

other minorities as well. Jones recommended that improving teaching methods rather than correcting the Black English of African American students could yield a positive effect on achievement in mathematics.

Several studies have linked the decline in Black student selection of upper level mathematics courses to how the subjects are taught. This, of course, will imply that Black students are not being effectively taught in our school mathematics program. What one finds is that school mathematics and the manner in which it is delivered are in opposition to the communication and learning styles of Black Americans, who still embrace and practice cultural elements that come out the African experience, Stiff and Harvey (1988). Cognitive styles appear to have something to do with how Blacks learn. Hale (1982) reported that Black people and lower-income people tend to utilize the relational cognitive style. This implies that learning for Black people must have a personal reference. However, Cohen (1969) noted that upper-class people also tended to utilize a predominantly relational style. Cohen's work on cognitive style described two types of learners - analytical and relational. More recent studies on cognitive style have described Black students as being field dependent and White students as field independent.

FIELD-DEPENDENCE-INDEPENDENCE

Hale (1982), Jones (1986) Stiff and Harvey (1988) reported that the type of mathematics instruction in the school may have an effect on the decline of Blacks in mathematics. Both Jones (1986)

and Stiff and Harvey (1988) reported that instruction in the classroom has been more field independent. "This type of instruction in the classroom has been more field independent. This type of instruction values analytical thinking and systematic approaches to problems. The cultural background of Blacks, according to the authors mentioned above, is seen as promoting field dependence. This type of learning includes Kinetic-tactile rather than visual information processing emphasis. Furthermore, this type of learning relies heavily upon identity, security (need of frequent feedback), and some type of acknowledgement of achievements (Stiff and Harvey, 1988). Field dependence is in conflict with the dominant style that is expected from the students. It should also be noted, however, that Black students are more likely to excel in mathematics if they establish a strong relationship with a mathematics teacher (Jones, 1986).

SUMMARY

The decline of Blacks in mathematics was found in many common threads of the review of literature. According to the review, Black students are not in mathematics/upper level mathematics because of the following reasons:

1. absence of appropriate role models in mathematics and significant others
2. failure to receive positive career and course counseling at the appropriate time
3. lack of a congruence between mathematics programs of study

and intended career

4. lack of success in previous math courses (elementary, middle, junior high, etc.)
5. inability to see usefulness and relevance of math to their lives
6. lack of the rudimentary skills required for successful experiences in upper level secondary courses in mathematics
7. lack of social economic means to support appropritate mathematical experiences in and outside of school
8. math anxiety contributes to a student's attitude toward mathematics which influences an individual to enroll in lower or no mathematics courses
9. poor teaching methods contribute to low mathematics comprehension and achievement of Black students in mathematics

IMPLICATIONS

Based on the summary of related literature for this paper, implications are as follows for elementary, secondary and higher education:

ELEMENTARY

1. Teachers must design and provide successful elementary experiences for Black children.
2. Teachers must be sensitive to how students' process information to learn mathematics.
3. Principals, teachers and parents must act as role models

to motivate the students by their positive comments which will create positive attitudes toward mathematics studies.

4. Teachers and the principal must look for and correct basic skill deficiencies of students at each grade level.
5. Teachers must make mathematics teaching revelant for Black children and
6. Teachers should teach to individual needs of each Black child.

SECONDARY

1. Secondary schools should develop role model programs and mathematics teachers should identify Blacks who are working in the field of mathematics or math related fields and share with students in their classes
2. Teachers and counselors must provide more information to Black students on mathematics courses appropriate for their intended careers
3. Teachers and principals of schools should provide more successful experiences in the mathematics classroom for Black students and
4. Teachers and the school (principal and staff) should develop programs and provide classroom experiences to compensate for socio-economic status differences in students

COLLEGE

1. Institutions should increase the number of Black faculty and staff, in mathematics and math related areas to provide more identity for Black students to see themselves in this area
2. Institutions should have supportive services that will assist the students with difficult learning concepts in mathematics courses
3. Professors should use varied teaching methods to accomodate different cognitive styles of learning and
4. Institutions should have some preparatory exercises to prepare Black students to take various types of standardized exams which test mathematical skills.

REFERENCES

Ascher, C. (1983). Improving the mathematical skills of low achievers. ERIC/CUE, Fact Sheet number 18. New York: ERIC Clearinghouse on Urban Education. ED 237 584 U D 022 915

Ascher, C. (1985). Increasing science achievement for disadvantaged students. ERIC/CUE Digest Number 25. ERIC ED 253 623.

Cohen, R. (1969). Conceptual styles, cultures conflict and nonverbal tests of intelligence. American Anthropologist, 71, 828-856.

Cooper, C. (1983). Discriminant factors in the choice of a non-traditional "math and science-oriented" versus a traditional "people-oriented" career for Black students. ERIC Reports - Research/Technical 143. ED 241 855.

Davis, Josephine. (1986). Proposals for Improving the NAEP Mathematics Assessment of Black Youth. ERIC ED 279 674

Erbe, Brigitte-Mach; Van-Dam, Thomas (1982). Achievement and Attitudes of Students from Desegregated Elementary Schools at the time of High School Graduation. South Holland School District 151, Ill. ERIC ED 297 059.

George, Catherine (1990). Course Enrollment Practices of High School Students in California. California State Department on Education, Sacramento. ERIC ED 317 897.

Hale, J.E. (1982). Black Children: Their roots, culture, and learning styles. Utah: Brigham Young University Press.

Harvey, W.B. (1988). Perspectives on schooling and socioeconomic advancement for Black Americans. Journal of Black Studies 19(2), 131-134.

Johnson, M.L. (1984). Blacks in mathematics: A status report. Journal for Research in Mathematics Education. 15 (2), 145-153.

Jones, D.J. (1986). Cognitive styles: Sex and ethnic differences. Paper presented at the Annual Meeting of the American Educational Research Association (Washington, D.C., November 13-15, 1986) ERIC ED 284 907

Jones, J. A. (1990). Look at math teachers, not "Black English". Institute for Independent Education, Inc. Washington, D.C ED 314 537.

Kenschaft, P.C. (1987). Black men and women in mathematical research. Journal of Black Studies, 18 (2), 170-190.

Kirk, G.E., Hunt, J. McV., and Volkmar, F. (1975). Social class and preschool language skill: V. Cognitive and semantic mastery of numbers. Genetic Psychology Monograhs, 92, 131-153.

Matthews, W. (1984). Influences on the learning and participation of minorities in mathematics. Journal for Research in Mathematics Education, 15, 84-95.

Rancifer, J. L. (1978). An investigation of attitudes toward Mathematics determining the election and non-election of college Preparatory Mathematics by Secondary Black and White students (Doctoral dissertation, Kansas State University, 1978). Dissertation Abstracts International, 39, 2802A.

Reyes, L.H. and Stanic, G.M.A. (1985). A review of the literature on Blacks and Mathematics. Paper presented at the Annual Meeting of the American Educational Research Association (69th, Chicago, IL, March 31-April 4, 1985). ERIC ED 257 643).

Sang, H.A. (1987). Closing the education gap: A Mayo clinic approach to academic achievement. Paper presented at the Annual Meeting of the American Association of School Administrators (New Orleans, LA, February 20-23, 1987). ED 288 235 EA 019 690

Stiff, L.V., and Harvey, W.B. (1988). On the education of Black children in mathematics. Journal of Black Studies 19 (2), 190-203.

Stiff, L.V. (1985). A people at risk: Black math and science teachers needed. Minority Voices, 8 (1), 64-66.

Thomas, G. E. (1983). Math Readiness and Preparation for competitive college majors and careers: The case of Black Students. John Hopkins University, Baltimore, MD. Center for Social Organization of Schools. ERIC ED 233 906.

Tobias, S. (1978). Overcoming Math Anxiety. New York: W.W. Norton and Company, Inc.

Willig, Ann and others. Sociocultural and Educational Correlates of success - Failure Attributions and Evaluation Anxiety in the School Setting for Black, Hispanic and Anglo Children. American Educational Research - Journal V. 20 N 3.

Williams, D. (1982). Achievement outcomes in public and private schools: A closer look at the high school and beyond data. Stanford University, California Institute for Research on Educational Finance and Governance. National Institute of Education (ED), Washington, D.C. IFG-TTC-9 ED 224 157 EA 015 249.